

PROCEEDINGS  
OF THE  
LINNEAN SOCIETY  
OF  
NEW SOUTH WALES.

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WEDNESDAY, MARCH 28TH, 1900.

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The Twenty-fifth Annual General Meeting of the Society was held at the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, March 28th, 1900.

The Hon. James Norton, LL.D., M.L.C., President, in the Chair.

The Minutes of the previous Annual General Meeting were read and confirmed.

The President delivered the Annual Address.

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PRESIDENTIAL ADDRESS.

I have to congratulate the Society on its having completed the 26th year of its existence, which could scarcely have been possible but for the liberality of its active founder, the late lamented Sir William Macleay, and for the laborious devotion of many of its leading members.

The number of members at the end of 1898 was 78, but, as our worthy Hon. Treasurer took it much to heart that the membership

of so useful a Society should be so comparatively small, a resolution was passed on 19th April, at his instance, that, during the residue of the year, the payment of an entrance fee should be suspended. The result was an accession of 38 new members, besides one associate, and the roll at the end of 1899 was increased to 116.

As it was thought that another innovation, in the shape of light refreshments at the close of each monthly meeting, would mitigate the objection sometimes made, that the Society's house was rather inaccessible to many of its members, the new arrangement was brought into operation during the Session, and appears to have worked satisfactorily.

As the Hon. Treasurer's accounts deal fully with the financial affairs of the Society, it is not necessary for me to enter into particulars, but I think it right to point out that the expenditure, in connection with Bacteriology, has, during the years 1898 and 1899, amounted to £1262 8s. 9d.

Members will no doubt think that, for this large amount, something more than two papers, read at the monthly meetings, might have been expected; but the facts must not be overlooked that Bacteriology is a new science, and that the difficulties of starting an institution, for its study and all necessary investigations, in this colony are much greater than in England or any part of the European continent or America, and that, however much progress may have been made during the past 18 months, it could hardly be expected that great results could be exhibited after so short a period of initiatory work.

I am glad to be able to state that all our Bacteriological fittings, apparatus, chemicals, and books, are very complete, and in so satisfactory a condition, that during the the next six months we are entitled to look forward to equally satisfactory results.

I regret to have to announce the death in October last of Mr. W. Kershaw, Senr., one of our ordinary members, who was for many years officially connected with the National Museum of Melbourne, and whose knowledge of the Victorian fauna was very considerable.

During the year 40 papers on various subjects of interest were read at the monthly meetings, and various interesting exhibits were produced, as will fully appear in Volume xxiv. of the Society's Proceedings, three Parts of which have been already issued, and the fourth or final Part is now in the printer's hands.

As it is usual, on occasions like the present, for the President to address the members on some subject of interest, I have not thought it right to depart from the usual custom, although the preparation of such an address has been no small tax on my leisure hours.

The subject, which I have chosen and which has long been of interest to me, is the question of the age of Australia; a subject which, however, I admit, requires more knowledge and more careful handling than I have been able to bring to bear upon it.

Our great island continent having now been frequently crossed and recrossed in various directions, and pretty fully explored, at the expense of many valuable lives, and of an enormous amount of suffering by the less unfortunate explorers, and the crude notion of the existence of a great inland sea having been entirely dissipated, a not inconsiderable mass of evidence has become available for the consideration of the question of the age of Australia.

Far be it from me to pretend to deal authoritatively with this question, for the more I have thought over it, the more my incompetence to deal with it has been brought home to me. I trust, therefore, that what I am about to say may be looked upon merely as hints, thrown out with the view of inducing competent scientists to deal with the question. It will of course be so readily understood that I have been indebted to many authors for most of my facts, that I have only in a few instances quoted authorities.

It is not necessary that we should go back to the very origin of the universe, but a few words, by way of preface, may, perhaps, not be thought inappropriate.

I therefore commence with the statement that, in the beginning of the present order of things, the whole universe was filled with matter of extreme tenuity, and generally supposed to have been

intensely hot, though the existence of heat in the first instance does not seem to be an absolutely necessary postulate, it being quite conceivable that this immense mass of matter may have been able to generate sufficient heat, by means of the internal motion with which it was endowed.

The matter in question was a homogeneous mass of atoms, each being an exact counterpart of every other, all being in motion ; but the homogeneity continued only until these atoms, in obedience to a law impressed upon them, began to arrange themselves in various manners, and thus to form molecules which, according to their arrangement among themselves and their distances from each other, formed the different elements with which we are acquainted, and no doubt others which we have not yet discovered.

The whole nebulous mass began to part with its heat, but, as there was at first no space not already filled with matter equally hot, it is difficult to determine whether the lost heat became latent, or was converted into motion, electricity, or light, or (if the theory that heat is not a condition of matter, but an actual fluid substance, is tenable) into some other form of matter, or what became of it.

However this may be, the diffused matter gradually cooling and shrinking, began to curdle into vast divisions, each of which was the commencement of a system, such as our own solar system; and these embryo systems, having acquired a circular motion, and continuing to cool and consolidate, presently threw off rings, which, on breaking and rolling themselves together, became planets, and some of these again in due course threw off other rings, which became secondary planets or moons.

The earth, which was originally one of the rings thrown off by the sun, was at first a seething mass of intense heat, and, being then self-luminous, shone like a star ; but, continuing to cool and consolidate, its surface, although racked for long ages by terrific explosions, earthquakes, tornadoes, and other disturbances, continued to grow firmer, and, ultimately, as things became more settled, and further consolidation made it possible, seaweeds,

followed by the higher forms of vegetation, then marine and terrestrial animals, and ultimately intelligence, in the shape of man, appeared on the scene.

Cooling and consequential shrinkage divided the surface of the earth into land and water, and, by lateral thrust and folding, produced mountains, which gave rise to rivers; and these, with a constant heavy rainfall, wore down and denuded the mountains, and spread mud and débris over the beds of oceans, lakes, and depressed places, thus forming strata, which gradually built up and consolidated the whole of the earth's surface, including not only those parts which appeared above the water, but all the land covered by oceans, for these, being of insignificant depth compared with the whole mass of the earth, need not be taken into account.

The operations going on at this stage being so exactly the same everywhere, it may reasonably be asked why the whole surface of the earth was not converted entirely into dry land perfectly level, or else covered everywhere by water of an even depth; but the answer to this question must be that the earth revolved round the sun, not in a true circle, but in an ellipse, that its axis was not at right angles with the plane in which it revolved, and that the variations thereby effected would necessarily produce consequential variations in the operations and their effect, then moulding the surface.

During the turmoil of these troublous times, and apparently in the Cambrian epoch, some part of Australia arose above the ocean, and other parts appeared later in geological sequence.

Australia was originally very different in shape, size and features from what it is at the present day, and it is evident that, at no very distant geological date, not only Tasmania, but also New Guinea, formed part of the continent.

In the general instability of everything, Australia, after its birth, or the greater portion of it, must have been several times submerged beneath the waves before it began to settle down, in the Tertiary age, to its present form.

It is certain that, even then, it extended considerably more to the eastward than at present, and that in the west there existed a range of high mountains, from the wear and tear of which the strata of the lower lands were formed.

A great basin, over the centre of which Sydney now stands, and which extended from beyond Newcastle on the north to Shoalhaven on the south, and from beyond Hartley on the west to a distance of 70 miles or more to the eastward of the present coast line, then existed, and in this basin was formed the immense mass of coal which is of such incalculable value to New South Wales.

This basin gradually subsided, during the formation of the coal; and, in the Triassic period, sank beneath the Pacific Ocean. This subsidence may have been caused wholly or partially, firstly, by the pressure on the semifluid underlying matter, of the accumulations of vegetable matter, which were ultimately converted into coal, and secondly, by the constant sinkage of cool water, which would have the effect of contracting the heated matter lying below.

In the vicissitude of things, the eastern half of the submerged basin was cut off and permanently lost, though the residue, consolidated by the deposition of the Hawkesbury sandstone, afterwards rose again, but again sank so as to allow the deposition of the Wianamatta shale above the sandstone and the deposition of the Cretaceous beds of Triassic age in Queensland, South Australia, Western Australia, and the north-west portion of New South Wales.

Finally, the remnant of the great basin again rose in the Tertiary era, since which there has been no further sinkage of any importance. Wallace supposes that Australia, being an ancient continent of Quaternary or Tertiary age, is gradually decreasing in size, as indicated by the gradual subsidence of New Caledonia and certain other South Pacific islands.

After the loss of the eastern half of the coal basin, the east coast of New South Wales stood at about twenty miles eastward of the present coast line, but it has since been gradually cut into

and worn down by the continuous roll of the Pacific Ocean, assisted by the revolution of the earth, which, co-operating with it, unceasingly hurls the whole of the eastern face, at the rate of about 500 miles an hour, against the waters of the ocean (which are not able to move as quickly as the solid land), and so increases their power.

By these means the inhospitable looking cliffs, which form a great part of our eastern boundary, are being continually thrown down and crushed into sand, available for the formation of the sandstone rocks of the future.

The loss of land, on the eastern side, was wholly or partially compensated, by the upheaval (?) on the south side, of a large tract of land, in the great Australian Bight, of over 200 miles in length with an extreme depth of 150 miles. It is, however, by no means clear that this was a case of upheaval, for it is possible that it, and many other so-called upheavals, are really due to the sinkage, into the body of the earth, of portion of the water forming the oceans lying on its surface, which are being thereby continually lowered.

Although it is evident that, after Australia first appeared as dry land, enormous disturbances took place on its eastern side, the far distant interior with its immense plains, inexpressibly dreary in their dull arid uniformity, does not appear to have undergone similar disturbances; and, being situated on a parallel unaffected by the comparative regularity of the weather of the Torrid and Arctic zones (the rains of which, as a general rule, exhaust themselves before reaching the desolate expanses which scarcely afford subsistence to the few miserable savages who roam over them) has only of late years been opened up to investigation by scientific men, and occupation by graziers.

A great portion of the Blue Mountain Range can hardly be considered as mountains, being really only an elevated plateau, through which great gorges have been cut by the rains of long ages; but, in the interior, many of the mountains, such for instance as the McDonnell Ranges, are quite entitled to the designation. These last are supposed, by some of the leading scientific men of

Australia, to be older than any other part of the continent, comprising as they do the so-called Larapintine limestone of Silurian formation. The oldest known rocks on our own mountains consist of slates and limestones, also of Silurian age.

In Mesozoic times, the Australian flora consisted mainly of *Filices*, *Lycopodiaceæ*, *Equisetaceæ*, *Coniferæ*, and *Cycadaceæ*, but, in Tertiary times, these were almost superseded by a very different flora, including among other trees the Oak (*Quercus*), Beech and Cinnamon. The *Equisetaceæ* have long since disappeared; the *Lycopodiaceæ*, which formerly attained the height of 50 feet, have dwindled down to 12 inches; the *Coniferæ* are represented by *Araucaria*, *Podocarpus*, *Dammara*, and a few other genera, most of which are only found in the north; various *Cryptogams* still flourish in such places as our now arid climate will permit, but the *Cycads* which flourished to an enormous extent in Oolitic times in Europe, and have now quite disappeared from that region, have managed, in the shape of *Zamia*, to survive all misfortunes, and still grow profusely in Australia, and are looked upon by botanists as examples of living fossils.

The old flora, except in some instances, the survival of which is difficult to account for, perished, but, when Australia, in the Tertiary period, finally arose from her watery bed, it was succeeded, in the later part of that period, by a strange flora, differing almost entirely from the floras of every other part of the world. In particular the *Eucalyptus* and other giant species of *Myrtaceæ* then began, as they do now, to clothe the surface, almost to the exclusion of all other orders, and, having spread uninterruptedly (probably from west to east) have gone on, for vast periods, producing from time to time new varieties, which have ultimately become species, as they advanced from one side of the continent to the other, and these species have been continually inter-fertilizing, and producing such a tangle as makes a definite and reliable classification by botanists almost an impossibility.

It must be evident that these processes occupied a vast space of time, and that they could not have been interrupted, during their whole operation, by any general submergence of the surface, for



that would inevitably have destroyed all animal and vegetable life. Botanists would have been saved from a great deal of labour and uncertainty, in classifying the "gums," if parts of the region with which we are dealing had been submerged, so as to break the chain of variation, and by that means convert what now seem to be mere varieties into what would then be naturally considered distinct species.

It seems to me that the *Eucalypti* and kindred species of *Myrtaceæ* alone, without taking the *Leguminosæ*, the *Proteaceæ*, and other orders into account, conclusively prove Australia to be immensely old.

The origin of the Australian aborigines is as yet, and probably will be for ever, entirely unknown. Whether the ancestors of the present fast disappearing race arrived originally from Asia, Africa, or America, and whether immediately or mediately through some of the South Sea islands, it is not surprising that the barren inhospitable nature of their new home, unameliorated by the slightest attempt at cultivation, should have completed their degradation to almost the very lowest plane of humanity. Notwithstanding the vast space to be covered, they gradually spread themselves sparsely over the whole of the island, the faculties necessary for the prolongation of their miserable existence having been sufficiently sharpened by the necessities of the case.

The spread of these people over such a tract of three millions of square miles, a great part of which was an inhospitable desert, the development of scores of languages, comprising the most extraordinary inflections and complications, and the institution of so many barbarous rites and revolting customs, must have occupied an immense period, the length of which, in the entire absence of records and traditions, cannot even be guessed at.

Until the arrival of the white man, they were still in the stone age, and this fact alone carries them back many thousands of years (which, however, is a very short time when compared with geological epochs) and evidences the entire stagnation of civiliza-

tion among them, if it is permissible to use such a word in connection with the state in which they existed.

It seems probable that the ancestors of the present aboriginal race were not the first human inhabitants of Australia, and that their predecessors were the ancestors of the lately extinct Tasmanian race. The Tasmanians, although resembling the Australians in colour, in their not constructing permanent dwellings, in their absolute nakedness, in the use of stone implements, wooden spears and waddies, and in other particulars, were evidently of another and an inferior race, for they had woolly hair, and were ignorant of the boomerang, the wommera and the tomahawk; and, there being no Dingoes in their island, they did not possess any pets until the introduction of dogs by the white man; while the shields and canoes which they used, if any, were of very inferior character.

Although there is no evidence of the fact, it seems likely that, when the Australians arrived, they found the Tasmanians in possession, and being a stronger and more domineering race they, in course of time, drove the latter gradually further south, as the Maori in New Zealand is supposed to have driven the Moriori to Stewart Island; but the Australians did not care to follow the Tasmanians across the Straits and extirpate them after the manner of the Maori.

It was for a long time supposed that the Dingo, being the only placental in Australia except a few bats and rodents, was introduced by man, and this supposition was hardly questioned until the bones of this animal were found under a considerable depth of volcanic ashes, in a fossil state in conjunction with those of the Tasmanian Devil (*Sarcophilus ursinus*), *Thylacoleo*, the gigantic extinct kangaroos, (*Macropus titan* and *M. atlas*), and of the genera *Nototherium*, *Procoptodon* and *Diprotodon*; from which fact it was argued that the dog was indigenous, and must have been here before man.

But the existence of only one placental, in an island where every other animal was marsupial, seems an anomaly only to be accounted for on the assumption that, after Australia with all

her existing *Mammalia* but with no placentals, had been cut off from the rest of the world, the aborigines had arrived with their dogs and driven off the old race, before they had been able to obtain any of these dogs from the last comers. If some such thing as this had not happened, and the Dingo had been indigenous, it is difficult to understand why it had not crossed to Tasmania.

If there is anything in these suppositions, man must have been in Australia while her now extinct volcanoes were active, and while her great fossil beasts were still in the flesh; but it is right to say that there is no proof of this, although carefully searched for.

I have taken little account of the bats and small rodents, as the former could easily have flown across from New Guinea or elsewhere, and the latter might as easily have been introduced by the new comers in their canoes, or have floated over on drift wood and rubbish.

It is well known that all Australian mammals, with the exceptions mentioned, but including many which being now extinct are only known by their fossil remains, fall within the order *Marsupialia*.

A few examples of this order have been discovered in America, the Malay Archipelago, Celebes, Amboyna, Banda, and Timor; but Australia, including Tasmania and New Guinea, is their stronghold, and has been characterised as their metropolis. A great number of Australian marsupial families are found nowhere outside this region. The brains of these creatures prove them to be of a very low order in the scale of animal life, and it is supposed that they everywhere preceded the placental mammals, none of which are known to have existed before the Tertiary era, although the Cretaceous rocks of North America and the underlying Jurassic or Oolitic rocks, both of that continent and of Europe, shew that marsupials, allied to the primitive carnivorous types now inhabiting Australia, were once widely spread over Europe; and the remains of like animals have now been discovered in Patagonia. As these marsupials were quite



unknown in Europe after the Jurassic period, Lydekker assumes that during it, or sometime afterwards, they reached Australia, where they have ever since been completely cut off from all the rest of the old world. Being free from the competition of the higher types, they have flourished and developed to an extent which would otherwise have been impossible. One or two of the kangaroos, now found only in a fossil state, attained gigantic dimensions, and the *Diprotodon* must have been fully as large as the largest *Rhinoceros*.

Although the Emu is not unrepresented elsewhere, being related to the ostrich of Africa, and more closely to the lately extinct *Dinornis* of New Zealand, and also to the *Rhea* of America, it and the rarer Cassowary may be considered survivors of a perishing race.

Gould remarks that Australia comprises peculiarities unexampled in any other portion of the globe; that she possesses almost exclusively the *Marsupialia* and *Monotremata*, and many singular forms of birds especially adapted to find their existence among her very remarkable flora and equally remarkable insects.

Many years ago some strange fossils were discovered in the European rocks of the Secondary period, where they seemed to be extremely abundant. These consisted of the jaws of a fish, completely paved with teeth, which greatly puzzled palæontologists until a fish, with exactly the same jaws and teeth, was discovered alive in Port Jackson, and was named "*Cestracion Phillipi*." It has now also been recorded in a few other places.

Some other remarkable teeth having been found in Triassic rocks in England, the fish to which they belonged was called by Agassiz "*Ceratodus*," and was naturally supposed to be quite extinct, but, to the great astonishment of naturalists, it was afterwards found living in a few Queensland rivers. It has been found nowhere else. It is remarkable on account of its breathing by both lungs and gills.

Another fish originally known only by its remains in Cretaceous and early Tertiary rocks, and characterised by having a row of

scutes on the back as well as one on the belly, has recently been found living in some of our rivers.

Equally strange discoveries have been made with respect to shells, the first discovered being the beautiful *Trigonia*, known for a long time only as a fossil of the Secondary and Tertiary rocks, but this shell was afterwards found alive in Port Jackson and Tasmania. Buckland first pointed out the remarkable fact that these shells, being in their fossil state associated with *Cestracion*, the same association prevailed in their modern state.

I will only mention one other instance of survival in Australian waters, namely, that of the curious *Brachiopoda*, commonly known as "Lamp Shells," which, in Secondary and Tertiary times, were so abundant as to have formed in some instances thick strata of rock.

So many discoveries of "living fossils" having been made in Australia, it was not unreasonably expected, by the projectors of the Horn Expedition, that older forms of life than those prevailing elsewhere would be found in the more inaccessible parts of Australia, such as the McDonnell Ranges, which, being of Silurian age, were supposed to have existed as islands before the rest of the continent had accomplished its final emergence from the ocean; but in this expectation they were disappointed.

On careful consideration of all the facts which I have stated, I have little doubt that, after Australia had been cut off from the old world, Tasmania and New Guinea were cut off from Australia, but, although various changes afterwards took place, there always remained above the ocean, since their arrival, a home for the plants and animals mentioned, which have therefore been able to survive to the present day, while their less fortunate congeners, located in other lands, being cut off by the submergence of their homes, have perished and left no other record of their former existence than their fossil remains.

Australia is unique as being the home of so large an array of plants and animals, which have very appropriately been called "Living Fossils," and, for this reason, strengthened by facts which I have mentioned, I cannot doubt that, counting as

geologists do from her last upheaval, which took place in the early part of the Tertiary era, she comprises perhaps the oldest land on the globe.

If this absence of submersion since Triassic times be conceded, and if any reliance can be placed on Goodchild's calculation, or I should perhaps rather say surmise, as to the length of the Tertiary period, the age of Australia may be stated at upwards of 93,420,000 years, while he calculates that the time which has elapsed since life first appeared on the earth amounts to no less than 704,235,000 years.

On the motion of Mr. Henry Deane an appreciative vote of thanks was accorded to the President for his interesting Address.

The Hon. Treasurer presented his balance sheet, and moved its adoption, which was carried. The Society's total income for the financial year ending December 31st, 1899, was £1,549 16s. 1d.; the total expenditure, £2,018 14s. 9d., which, with a credit balance of £878 5s. 3d. at the beginning of the year, and with £350 placed at fixed deposit in the Commercial Bank, left the Society's ordinary account with a credit balance of £21 14s. 3d., and the Bacteriology account with a credit balance of £37 12s. 4d.

No other nominations having been received, the President declared the following elections for the current Session to have been duly made :—

PRESIDENT : Hon. James Norton, LL.D., M.L.C.

MEMBERS OF COUNCIL (to fill six vacancies) : Messrs. R. T. Baker, F.L.S., W. W. Froggatt, F.L.S., C. Hedley, F.L.S., A. H. S. Lucas, M.A., B.Sc., T. Steel, F.C.S., F.L.S., F. Turner, F.L.S.

AUDITORS : Messrs. E. G. W. Palmer, J.P., and Duncan Carson.

On the motion of the Hon. Treasurer it was resolved that the suspension of the operation of Rule vi., providing for the payment of entrance fees, should be continued for all members nominated or elected during the year 1900.